

25th.—South Bend, Ind., thunderstorm.
26th.—Donaldsonville, La., stock killed by lightning. Lexington, Ky., thunderstorm. Concordia, Kans., windstorm.
27th.—Corning, Ark., hailstorm. Collegeville, Minn., windstorm.
28th.—Brookfield and Honeymead Brook, N. Y., thunderstorms. Near St. Charles, Mo., hailstorm. Carthage, Mo., thunderstorm. Belle Rose, La., 2 horses killed by lightning.
29th.—Cornwall, Vt., 2 horses killed by lightning. Manchester, N. H., thunderstorm. New Haven, Conn., 2 persons injured by lightning. Near Newton, N. J., windstorm. Stanardsville, Va., hailstorm. Atlanta, Ga., and

Nashville, Tenn., thunderstorms. Springdale, Tenn., and Ellsworth, Ohio., windstorms. Grovedale, Mo., hailstorm. Near Heber City, Utah, thunderstorm.

30th.—Middletown, N. Y., 4 persons stunned by lightning. Scotchtown, N. Y., 2 cows killed by lightning. Howells, N. Y., and Granite Falls, Minn., thunderstorms. Luverne, Minn., stock killed by lightning. Morris, Minn., hailstorm.

31st.—Glastonbury and Weathersfield, Conn., hailstorms. Fleming, N. J., thunderstorm. Pensacola, Fla., one person stunned by lightning. Brooksville, Fla., and Nashville, Tenn., thunderstorms. Litchfield, Ill., windstorm. Steffen-ville, Mo., stock killed by lightning.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger point and the highest and lowest stages for the month of July, 1894:

Heights of rivers above low-water mark, July, 1894.

Stations.	Danger-point gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La.	29.2	5.5		—1.8	31	7.3
<i>Arkansas River.</i>						
Fort Smith, Ark.	22.0	10.7	1	1.2	29, 31	9.5
Little Rock, Ark.	23.0	11.4	5	3.9	30, 31	7.5
<i>Missouri River.</i>						
Fort Buford, N. Dak.	25.0					
Bismarck, N. Dak.	75.0					
Pierre, S. Dak.	13.0					
Sioux City, Iowa	18.7	14.2	1	11.2	30, 31	3.0
Omaha, Nebr.	18.0	14.0	1	11.0	31	3.0
Kansas City, Mo.	21.0	19.6	3	13.4	31	0.2
<i>Mississippi River.</i>						
St. Paul, Minn.	14.0	2.8	1, 2	0.2	30	2.6
La Crosse, Wis.	10.0	4.2	1	1.3	31	2.9
Dubuque, Iowa	16.0	4.7	1, 2	1.2	31	3.5
Davenport, Iowa	15.0	3.3	1	0.6	31	2.7
Keokuk, Iowa	14.0	3.5	1	0.3	31	3.2
Hannibal, Mo.	17.0	4.1	1	1.1	29, 31	3.0
St. Louis, Mo.	30.0	17.0	1	8.8	31	8.2
Cairo, Ill.	40.0	18.3	1	9.7	30	8.6
Memphis, Tenn.	33.0	12.2	3, 4	4.9	31	7.3
Vicksburg, Miss.	41.0	17.0	1, 10	7.4	31	9.6
New Orleans, La.	13.0	5.7	1	3.9	25	1.8
<i>Ohio River.</i>						
Parkersburg, W. Va.	38.0	4.0	2, 3	0.6	22, 29	3.4
Cincinnati, Ohio	45.0	8.0	2, 3	4.1	27, 28	3.9
Louisville, Ky.	24.0	4.7	3, 5	2.7	20-31	2.0
<i>Cumberland River.</i>						
Nashville, Tenn.	40.0	6.2	3	2.0	20	4.2

Heights of rivers—Continued.

Stations.	Danger-point gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Tennessee River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Chattanooga, Tenn.	33.0	4.4	1, 4	1.8	17	2.6
Knoxville, Tenn.	29.0					
<i>Monongahela River.</i>						
Pittsburg, Pa.	22.0	6.0	27, 29	4.5	7	1.5
<i>Savannah River.</i>						
Augusta, Ga.	32.6	16.6	31	4.9	16	11.7
<i>Willamette River.</i>						
Portland, Oregon	15.0	23.0	1	12.4	31	10.6
<i>Susquehanna River.</i>						
Harrisburg, Pa.	17.0					
<i>Alabama River.</i>						
Montgomery, Ala.	48.0	2.7	25	0.8	3-5, 18, 19	1.9
<i>James River.</i>						
Lynchburg, Va.	18.0	1.0	1	0.7	8-22, 26-31	1.0
<i>Sacramento River.</i>						
Red Bluff, Cal.	22.0	1.8	1, 2	1.0	28-31	0.8
Sacramento, Cal.	25.0	15.6	1	9.6	31	6.0
<i>Des Moines River.</i>						
Des Moines, Iowa	19.0	3.8	1, 2	3.1	30	0.7

FLOODS.

The above table shows that the flood in the Fraser and Willamette rivers, which had risen above the danger line at Portland, Oreg., during June, has subsided, but that they were, on the 31st, only a little below the danger line. No other floods have been reported. In many cases the rivers are unusually low, and river navigation was generally suspended in the upper Ohio and Mississippi.

ATMOSPHERIC ELECTRICITY.

GENERAL STATISTICS.

The table on page 290 shows in detail for July, 1894, the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month.

THUNDERSTORMS.

A mention of the more severe thunderstorms reported during the month is given under "Local storms." The dates on which reports of thunderstorms were most numerous were the 1st, 6th, 13th to 21st, 29th to 31st.

The States where thunderstorm reports were most numerous were: Colorado, Florida, Massachusetts, North Carolina, Ohio, Pennsylvania, and South Carolina.

The States where the dates of thunderstorms were most frequent were: Colorado and Florida, where they were recorded every day in the month, and Louisiana, South Carolina, and Texas, where they occurred on twenty-eight days.

AURORAS.

The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four days preceding and following the date of full moon, viz, from the 13th to the 21st, inclusive. On the remaining twenty-two days of the month 191 reports were received, or an average of 9 per day. The dates on which the reported number especially exceeded this average were the 1st, 74; 7th, 33; 28th, 20.

The States from which auroras were reported by a large percentage of observers were: Delaware, Iowa, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Vermont, and Wisconsin.

DAMAGE BY LIGHTNING.

The following statistics of the damage done by lightning in July, so far as reported by the observers of this Bureau, are furnished by Mr. Alexander McAdie:

Thunderstorms and auroras, July, 1894.

States.	No. of stations.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Total.			
Alabama	52	T. A.	1	1	2	2	2	5	1	1				1	2	1	2	1	1		1		1			1	2	3	2	4	1	1	39	T. A.		
Arizona	49	T. A.	8	6	5	3			1	4	6	5	4	5	1		2	3	5	3	3	1	2	6	1	2		2	5	2	2	1	3	91	T. A.	
Arkansas	46	T. A.	5	2		5	6	1	1							2	6	2	4	5	3	5							3	1	1	1	2	55	T. A.	
California	307	T. A.	6	1	2						1	4	2	1	2		1			1				1									23	T. A.		
Colorado	82	T. A.	1	3	13	13	17	16	9	4	5	3	4	11	15	14	6	5	8	17	9	3	6	5	1	2	8	4	5	7	5	8	9	236	T. A.	
Connecticut	24	T. A.	3		6	7		3	1							11	4	1	1	4			5	1					2	4	11		4	67	T. A.	
Delaware	6	T. A.	1		1	1		1	1							1	1	1	1			2						1	1	1	1	1	12	T. A.		
District of Columbia	4	T. A.						1								1		1	1			1								1	1	1	6	T. A.		
Florida	34	T. A.	10	8	7	7	7	10	4	10	13	13	8	7	9	11	10	8	9	6	8	10	12	7	13	12	11	9	6	6	9	9	12	281	T. A.	
Georgia	64	T. A.	3	4	2	1	3	5	1	1	2					2	4	4	5	5	5	7	3	4		1	1	3			3	9	6	84	T. A.	
Idaho	23	T. A.		3	1	3			3				1				1	1	1					1	2		1					1		19	T. A.	
Illinois	58	T. A.	9	1		2								1				1	1	5	10	10				5	2	1	7	14	8	2	7	86	T. A.	
Indiana	42	T. A.	1																														1	28	T. A.	
Indian Territory	7	T. A.							1	1												1												6	T. A.	
Iowa	80	T. A.	2				1	1													14	1		2	8	3		1	2	11	1	9	18	74	T. A.	
Kansas	74	T. A.	9	1					3																									15	76	T. A.
Kentucky	39	T. A.	2	4			1									4	3	4	2	4	6	5	1		2	1				4	2	4	3	52	T. A.	
Louisiana	53	T. A.	3	7	16	6	8	10	11	12	6		4	9	10	7	12	6	8	5	11	10	7	1	1		10	3	10	8	10	3	224	T. A.		
Maine	18	T. A.	2			3	1	1	1	1	1	1	2	2	3	4	1					6				6	1				4	1		41	T. A.	
Maryland	29	T. A.	1	1	2	2		9								4	1	3	3			2	4		1	3		1	3	3	7	9	4	63	T. A.	
Massachusetts	85	T. A.	2	2	4	14	10		1			2	2	1	1	20	6	14	2	5		23	2		1	1	11			2	24		5	150	T. A.	
Michigan	83	T. A.	3	6	1				2			6	4	3			2	2			5	10				13	2	2	2	4	2		1	66	T. A.	
Minnesota	72	T. A.	4			2	7		3			5	1	3	5	5	1				3	6				3	11	6	2	7	13	9	14	5	109	T. A.
Mississippi	50	T. A.	16	6	1	3	3		9	1		6	3			4	9	5	5	6	4	5	8	5									114	T. A.		
Missouri	100	T. A.	5	6	2	3	5	9	2	6	3			4	9	5	5	6	4	5	8	5						5	2	3	4	3	5	223	T. A.	
Montana	30	T. A.	13	1	3	24	2		3					1	3	10	2	10	14	24	13	1		3	1			8	21	31	6	29	1	26	T. A.	
Nebraska	67	T. A.	1			1	3	3	1	1	1		1	2		1	1	4	1		2		1		1	3	1							7	57	T. A.
Nevada	50	T. A.	3	3	6		1	3	2	5		1	1			1	2			4	1		1		3	4			1	2	2	10	5	57	T. A.	
New Hampshire	28	T. A.	3	3	4	3	2	2			4	5	4	3	6	5	4	7	4	1	4	2	4	4	5	2								89	T. A.	
New Jersey	59	T. A.	3	5	2	4		9			1	3	2		3	3	4	1			1	3			1	8				1	11	1	1	66	T. A.	
New Mexico	31	T. A.	3			2		12								9	1	12	3	1		1	14				12			8	16	1	14	110	T. A.	
New York	81	T. A.		1	1		1	1		1	1	1	1	1	1			1	1		2	2			1		1		1				2	22	T. A.	
North Carolina	60	T. A.	1	12	6	5		16	1			4	4		11	6	6	1	1	2		6	6		1	6	1	1	1	1	9	2	2	121	T. A.	
North Dakota	34	T. A.	3	6	8	4	4	8	2						3	15	10	7	4	3	2	9	13	7	3	1	6	4	3	2	4	13	10	154	T. A.	
Ohio	140	T. A.	5			2		1	1		3	2			1				2	3		1	2						2	3	1		1	23	T. A.	
Oklahoma	17	T. A.	14	19		7	1	15						4	20	7		1	2		4	35	5		8	6	7	1		5	28	1		190	T. A.	
Oregon	65	T. A.							3																									4	10	T. A.
Pennsylvania	76	T. A.	2	2		4			4				2	4	3	10	8	2		1	3			1										46	T. A.	
Rhode Island	8	T. A.	13	9	1	2		21							3	6	2	7	5	3	1	17	10	1	1	9	1	7	5	10	25	3	8	170	T. A.	
South Carolina	46	T. A.			2											2	1					1												10	T. A.	
South Dakota	42	T. A.	7	7	5	2	14	10	2	1	4	1				4	6	8	8	7	2	6	4	6	4	6	7	9	2	2	7	11	2	154	T. A.	
Tennessee	40	T. A.		3		1	4	3	2				3	1	2	2	1			2	4			2	2	1		1	5	2		1	4	3	49	T. A.
Texas	86	T. A.	3	3	1	3	2	1					1	1	4	8	4	2	8	4	6				2			3	3	5	6	7	3	80	T. A.	
Utah	41	T. A.		3	1	4		5	7	2	3	2	1		1	3	1	3	4	4	2	2	6	4	1	2		2			1	3	2	2	71	T. A.
Vermont	15	T. A.			2	3	2		1			2	4	1	3	1	3	3					1	2		1				1	2	1	2	35	T. A.	
Virginia	42	T. A.	2	4	3	2		8					4	1	5	1	3	1	2			1	4	1	1		3			2	4	1		53	T. A.	
Washington	43	T. A.	4	2	2			3	1							4	4	3	2		1	1	5	1	2			4	1	1	8	5	2	55	T. A.	
West Virginia	38	T. A.	1																															1		

During July, 1894, 59 lives were lost and 94 persons injured; 41 barns, with a minimum loss of \$45,000, were struck; 33 dwellings, 12 churches, 2 academies, 3 mills or factories, and 2 railroad depots were struck; 24 horses, 13 cows, 5 mules, and 6 sheep were killed.

For purposes of comparison Mr. McAdie gives the following statement of the deaths due to lightning, so far as collected by the U. S. Weather Bureau, for the month of July during successive years, viz: 1890, 55; 1891, 52; 1892, 67; 1893, 73; 1894, 59.

OBSERVATIONS ON THE GREAT LAKES.

REPORTS FROM VESSELS.

The Lake Marine Section of the Forecast Division has received reports from the captains of 63 vessels navigating the Great Lakes. The following miscellaneous items are extracted from their reports:

Capt. Wm. Thorne, steamship *North Star*, 30th, aurora seen while off White Fish Point; first seen at 10.30 p. m. and continued for about one hour.

Capt. J. L. Weeks, steamship *City of Genoa*, 7th, buoy out of place in Sault River. 30th, Duck Island, Sault River, red buoy gone.

Capt. E. T. Rattray, steamship *Specular*, 9 p. m., 7th, to 3 a. m., 8th, northern lights in northern Lake Michigan.

Capt. W. S. Hoag, *Barge 130*, 1st, eastern Lake Superior, northern lights.

Capt. F. A. Graves, steamship *Matoa*, 2d, Middle Island, northern lights.

Capt. Donald McLean, steamship *City of Duluth*, 7th, southeast Lake Superior, northern lights.

Capt. D. Q. Bordeaux, steamship *H. J. Jewett*, 7th, Straits of Mackinac, northern lights.

Capt. G. B. Mallory, steamship *Mariposa*, 30th, eastern Lake Superior, northern lights from 9.30 to 11 p. m.

Capt. H. Zealand, steamship *Simon Lanzell*, 1st, western Lake Superior, northern lights.

Capt. Thos. Hackett, steamship *Volunteer*, 5th, Lake Erie, northern lights; also 7th, in St. Clair River, northern lights.

Capt. R. J. Cowley, steamship *Roumania*, 7th, brilliant aurora near Mackinac Island.

Capt. W. P. Garden, steamship *Tioga*, 1st, southern Lake Michigan, northern lights.

REPORTS FROM U. S. LIFE-SAVING STATIONS.

Through the co-operation of the General Superintendent of the Life-Saving Service and the Secretary of the Treasury, the Weather Bureau has received monthly reports for the month of June from the keepers of 33 U. S. Life-Saving Stations on the Great Lakes.

SUNSHINE AND CLOUDINESS.

GENERAL REMARKS.

The quantity of sunshine, and therefore of heat, received by the atmosphere is a fundamental factor in meteorology; the quantity received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends largely upon the distribution of cloudiness. The sunshine is now recorded automatically at about 38 regular stations of the Weather Bureau, either by its photographic or its thermal effects. The cloudiness is recorded by personal observations at all stations and is given in the column of "average cloudiness" in Table I.

SUNSHINE.

An instrumental record of sunshine has been kept during the month at 17 stations by means of the photographic sunshine recorder and at 21 stations by means of the thermometric sunshine recorder; the results of these observations are given in Table IV, for each hour of local mean time (not seventy-fifth meridian time). The stations recording the largest percentages of sunshine between the hours of 11 a. m. and 1 p. m. were: Baltimore, 94; Chicago, 95; Columbus, 94; Des Moines, 96.5; Detroit, 100; Salt Lake City, 96; San Francisco, 96.5; Tucson, 96.

The stations having the least percentage between these hours were: New Orleans, 58; Savannah, 55; Wilmington, 51.

The general average percentage for the whole month is given in the next to the last column of Table IV. The highest percentages were: Baltimore and Chicago, 85; Salt Lake City, 83; Columbus, Ohio, Des Moines, St. Louis, and Tucson, 82. The lowest percentages were: Wilmington, 36; Savannah, 48; New Orleans, 58.

CLEAR SKY.

The average cloudiness between sunrise and sunset, as based on numerous personal observations, is given for each Weather Bureau station in Table I; the complement of this average

cloudiness gives the observer's estimated percentage of clear sky, and these latter numbers are given in the last column of Table IV.

COMPARISON OF SUNSHINE AND CLEAR SKY.

The sunshine registers give the duration of direct sunshine whence the percentage of possible sunshine is derived; the observer's personal estimates give the percentage of area of clear sky. It should not be assumed that these numbers should agree, and for comparative purposes they have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental record of percentages of duration of sunshine is almost always larger than the observer's personal estimates of percentages of area of clear sky; the average excess for this month is 9 per cent for photographic records and 14 per cent for thermometric records:

Difference between instrumental and personal observations of sunshine.

Photographic stations.				Thermometric stations.			
	Instrumental.	Personal.	Difference.		Instrumental.	Personal.	Difference.
Tucson, Ariz.....	82	55	27	Baltimore, Md.....	85	69	16
Spokane, Wash.....	80	58	22	Chicago, Ill.....	85	81	4
Portland, Oreg.....	79	77	2	Salt Lake City, Utah....	83	63	20
Cincinnati, Ohio.....	76	60	16	Columbus, Ohio.....	82	58	24
Cleveland, Ohio.....	76	58	18	Des Moines, Iowa.....	82	72	10
Helena, Mont.....	75	69	6	St. Louis, Mo.....	82	62	20
Dodge City, Kans.....	74	66	8	Detroit, Mich.....	79	68	11
Kansas City, Mo.....	74	67	7	Key West, Fla.....	78	55	23
Washington, D. C.....	74	65	9	Philadelphia, Pa.....	75	54	21
Santa Fe, N. Mex.....	72	55	17	Boston, Mass.....	73	49	24
Bismarck, N. Dak.....	71	75	-4	Buffalo, N. Y.....	72	53	19
Denver, Colo.....	71	55	16	Little Rock, Ark.....	72	59	13
Galveston, Tex.....	71	71	0	New Haven, Conn.....	71	62	9
Memphis, Tenn.....	69	67	2	Vicksburg, Miss.....	69	70	-1
San Diego, Cal.....	68	73	-5	Colorado Springs, Colo..	63	47	16
San Francisco, Cal.....	68	65	3	Portland, Me.....	63	41	22
Eastport, Me.....	63	52	11	New York, N. Y.....	62	48	14
Savannah, Ga.....	48	38	10	New Orleans, La.....	58	57	-1
				Wilmington, N. C.....	36	45	-9
				Rochester, N. Y.....	59	59	0